

Virginia Division of Consolidated Laboratory Services-Richmond, VA

**SM 1020- 2011 Quality Assurance**

*"This section applies primarily to chemical and radiochemical analyses."(SM 1020 A- 2011.)(As published in SM 22<sup>nd</sup> Edition)*

Facility Name: \_\_\_\_\_ VELAP ID \_\_\_\_\_

Assessor Name: \_\_\_\_\_ Analyst Name: \_\_\_\_\_ Inspection Date \_\_\_\_\_

| Relevant Aspect of Standards | Method Reference | Y | N | N/A | Comments |
|------------------------------|------------------|---|---|-----|----------|
|------------------------------|------------------|---|---|-----|----------|

**Initial Demonstration of Capability (IDC)**

|  |         |  |  |  |  |
|--|---------|--|--|--|--|
| (1) Do IDCs include at least a reagent blank and four LFBs at a concentration between 10 times the MDL (LOD) and the midpoint of the calibration curve (or other level specified in the method)?   | 1020B.1 |  |  |  |  |
| (2) Are IDCs run after analyzing all required calibration standards?   | 1020B.1 |  |  |  |  |
| (3) Does the IDC reagent blank not contain any analyte of interest at a concentration greater than half the minimum quantitation level (MQL/ LOQ) (or other level specified in the method)?  | 1020B.1 |  |  |  |  |
| (4) Does the laboratory use one of the following as IDC acceptance limits?<br><input type="checkbox"/> established mandatory criteria<br><input type="checkbox"/> if there are no established mandatory criteria, laboratory- generated control limits calculated from the mean and standard deviation from at least 20 data points, within 70-130% recovery/ 20% RSD<br><input type="checkbox"/> PT acceptance criteria from inter-laboratory PT studies, translated to percent recovery limits | 1020B.1 |  |  |  |  |
| <b>MDL's</b>   |         |  |  |  |  |
| (5) Are MDLs performed or verified for each analyst and instrument, as well as whenever significant modifications to the instrument or operating conditions also modify detection or chemistry?<br>NOTE: Not required when test results are not reported outside of the calibration range (2003 NELAC Chapter 5 Appendix D.1.2.1).   | 1020B.4 |  |  |  |  |

Notes/Comments:

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| (6) Are MDLs determined in accordance with 1020.B.4?<br><input type="checkbox"/> ideally, at least 7 portions of a known standard over a 3-day period<br><input type="checkbox"/> all sample preparation steps included<br><input type="checkbox"/> measurements should be within 1 to 5 times the estimated MDL<br><input type="checkbox"/> recoveries should be within 50-150%<br><input type="checkbox"/> RSD should be values $\leq 20\%$<br><input type="checkbox"/> MDL=3.14 x standard deviation | 1020B.4          |   |   |     |          |
| (7) If calculated MDLs are not within a factor of 10 of the known standard, are the studies repeated at more suitable concentrations?   | 1020B.4          |   |   |     |          |
| <b>Reagent Blank</b>  |                  |   |   |     |          |
| (8) Does the reagent blank (method blank) consist of reagent water and all reagents, including preservatives, that normally are in contact with a sample during the entire analytical procedure?  | 1020B.5          |   |   |     |          |
| (9) Is the reagent blank analyzed after the daily calibration standard and after highly contaminated samples if carryover is suspected?   | 1020B.5          |   |   |     |          |
| (10) Is the reagent blank analyzed at a frequency of at least one per batch or on a 5% basis, whichever is more frequent?   | 1020B.5          |   |   |     |          |
| <b>LCS/LFB</b>  |                  |   |   |     |          |
| (11) Does the LFB (or LCS) consist of reagent water with associated preservatives, with a known concentration of the analyte(s) of interest added?  | 1020B.6          |   |   |     |          |
| (12) Is the LFB a concentration of at least 10 times the MDL, less than or equal to the midpoint of the calibration curve, or at a level specified in the method?   | 1020B.6          |   |   |     |          |
| <b>LFM</b>  |                  |   |   |     |          |
| (13) If feasible and the method does not specify a frequency, Is a LFM (matrix spike) included at a frequency of one per batch or on a 5% basis, whichever is more frequent?  | 1020B.7          |   |   |     |          |
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|---|------------------|---|---|-----|----------|
| <b>Matrix Dup</b>   |                  |   |   |     |          |
| (14) Is the LFM prepared by adding the analyte(s) of interest to the sample at a concentration at least 10 times the minimum reporting limit (MRL), less than or equal to the midpoint of the calibration curve, or a method-specified level? | 1020B.7          |   |   |     |          |
| (15) Is a matrix duplicate or a LFM duplicate (if the analyte(s) of interest are rarely detected in a matrix type) analyzed randomly at a frequency of one per batch or on a 5% basis, whichever is more frequent?                            | 1020B.8          |   |   |     |          |
| (16) If LFM duplicates are analyzed, is a second portion of sample spiked <u>before</u> sample preparation?   | 1020B.8          |   |   |     |          |
| (17) If the method does not provide limits for matrix duplicates or LFM duplicates, are preliminary limits calculated from IDC?   | 1020B.8          |   |   |     |          |
| <b>Calibrations</b>   |                  |   |   |     |          |
| (18) Are initial instrument calibrations performed using at least three standard concentrations for linear curves, at least five for nonlinear curves, or as specified by the method?   | 1020B.11.b       |   |   |     |          |
| (19) Is the lowest concentration of the calibration curve the reporting limit?  | 1020B.11.b       |   |   |     |          |
| (20) Are calibration standard concentrations chosen with no more than one order of magnitude between concentrations?  | 1020B.11.b       |   |   |     |          |
| (21) Are calibration acceptance criteria in the referenced method followed?   | 1020B.11.b       |   |   |     |          |
| (22) Are calibrations verified every 12 hours, after every 10 samples, or at the frequency specified in the referenced method, using a standard at or near the midpoint of the calibration range?   | 1020B.11.c       |   |   |     |          |
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| <b>Control Charts</b>  |                  |   |   |     |          |
| (23) Are accuracy (means) control charts constructed for each analytical method using either the calculated values for mean and standard deviation or percent recovery?  | 1020B.13.a       |   |   |     |          |
| (24) Are accuracy control charts updated each time a QC is analyzed?   | 1020B.13.a       |   |   |     |          |
| (25) If required by the referenced method, are precision (range) control charts constructed using the average and standard deviation of a specified number of measurements (e.g., %RSD or RPD) for replicate or duplicate analyses?  | 1020B.13.b       |   |   |     |          |
| (26) When sample measurements exceed control limits, is the analysis repeated immediately?   | 1020B.13.c       |   |   |     |          |
| (27) If a repeated measurement still exceeds control limits, is the analysis discontinued and the problem corrected?   | 1020B.13.c       |   |   |     |          |
| (28) If two out of three successive points exceed a warning limit (in the same direction), is another sample analyzed, and if that sample still exceeds the warning limit, is potential bias evaluated and the problem corrected?  | 1020B.13.c       |   |   |     |          |
| (29) If standard deviation is tracked, and 4 out of 5 successive points exceed 1 standard deviation (in the same direction), or in decreasing or increasing order, is another sample analyzed, and if the next point is more than 1 standard deviation or does not change the order, is the analysis discontinued and problem corrected? | 1020B.13.c       |   |   |     |          |
| (30) If seven successive samples are on the same side of the central line (indicative of a trend), are analyses discontinued and problem corrected?  | 1020B.13.c       |   |   |     |          |
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|--|------------------|---|---|-----|----------|
| (31) If measurements never or rarely exceed the warning limits, are the warning limits and control limits recalculated using 10 to 20 most recent data points? | 1020B.13.c       |   |   |     |          |
| (32) As an alternative to constructing control charts, are fixed limits from a database or list used for warning limits, control limits, and trends?           | 1020B.13.c       |   |   |     |          |

Notes/Comments: